Meta-data for Trase cattle slaughterhouse map v1.0

Summary

This nationwide map represents, to the best of our knowledge, the locations of cattle slaughterhouses in Brazil. This is a working product, and while every effort has been taken to avoid errors, Trase and UCLouvain do not accept responsibility for the accuracy of these data. Users who notice errors or would like to suggest improvements or new features should please to contact info@trase.earth, and these can be incorporated into later releases.

By "slaughterhouses" we mean facilities which slaughter animals (excluding facilities which handle animal products but are not directly involved in slaughter). Our map should be seen as a map of professional slaughterhouses; these are facilities owned by businesses, who have asset-level tax registrations provided by the National Registry of Legal Entities (CNPJ). It does not include small-scale slaughter for personal consumption or slaughter which is not linked to a slaughtering business.

This map was built by identifying cattle slaughterhouses listed in multiple data sources (see Table 2), including a government business registry, Guia de Trânsito Animal (GTA) data from 23 states, and lists of slaughterhouses audited under different food safety inspection systems (federal-, state- and municipal-level inspection databases, SISBI-POA, and SISBOV).

Businesses identified as slaughterhouses in the above data have been classified into three types (listed in the column "SUBCLASS"), depending on the evidence available that they are indeed slaughterhouses.
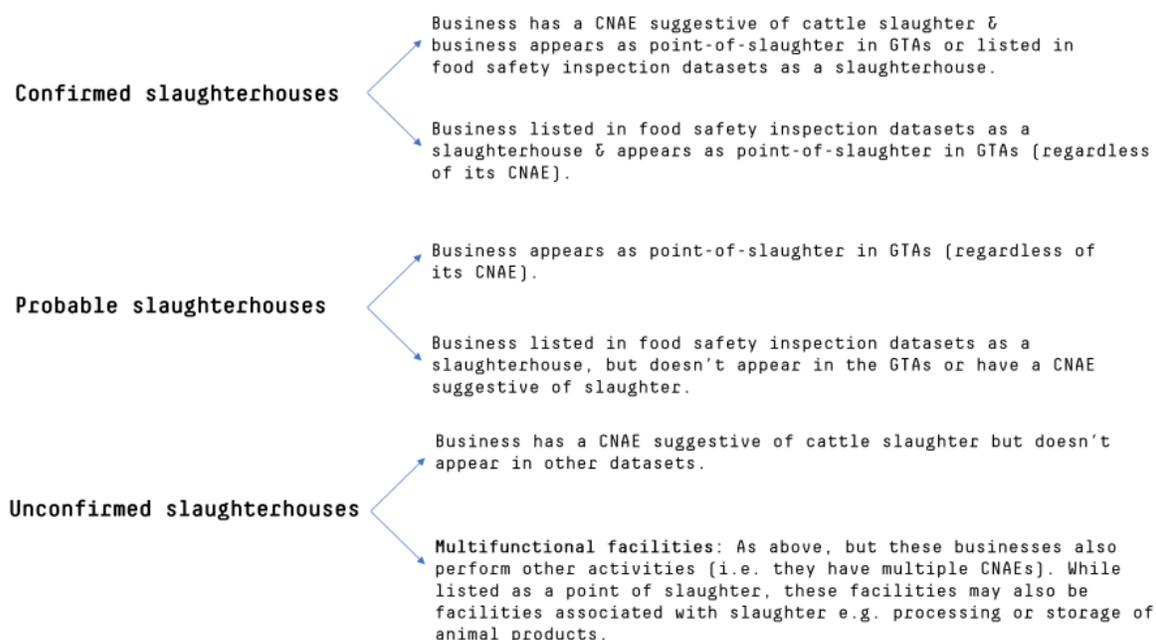
Figure 1 – Typology of slaughterhouses listed in column "SUBCLASS". Unconfirmed slaughterhouses are divided into ones where the business is associated with a single activity, i.e. it has a single Classificação Nacional de Atividades Econômicas (acronym: CNAE, National classification of Economic Acitivity in English – see Table 2 for more detail) of cattle slaughter, and businesses associated with multiple activities (multiple CNAEs including cattle slaughter). Unconfirmed slaughterhouses may include slaughterhouses which are no longer active, but have not yet been removed from the CNAE dataset.

The location of each slaughterhouse was then determined by a three-stage process. First, slaughterhouses were linked (using manually validated fuzzy string matching) to locations of slaughterhouses identified in three prior slaughterhouse mapping efforts (see Table 3). Where no match for a slaughterhouse was found,

we used the business' postal code (CEP) and the national postal code database (DNE) to assign a location. Finally, where the CEP was not available, we linked slaughterhouses to the municipal capital. The spatial resolution of the mapping of each slaughterhouse is listed in the column RESOLUTION. It is worth noting that 38 slaughterhouses identified in the Lapig, Abiec, and Imazon slaughterhouse maps did not match the business names in our nationwide databases. It is likely that most of these slaughterhouses appear in our data under different business names (because of changes in business ownership as well as cases where the same business may be referred to by different names), and so they were dropped from the map to prevent double-counting.

Note: since these data were first generated, a new slaughterhouse map for Mato Grosso has been released by Vale et al. (https://journals.plos.org/plosone/article/comments?id=10.1371/journal.pone.0215286). Though Vale et al. and this product rely on much of the same data, the two products are difficult to compare directly because they use slightly different methods: e.g. here we include all CNPJs which we identify as being associated with slaughter, regardless of size, while Vale et al. is limited to facilities slaughtering > 365 animals/year. Vale et al. also go to greater lengths to identify if/when facilities closed and include fieldwork to confirm questionable plants. Overall, we identify many more slaughter-associated CNPJs in Mato Grosso than Vale et al. Some of this difference may be because of Vale et al.'s use of a 365 head/year cut-off. When focusing only on 'large' slaughtherhouses, i.e. those which are state- and federally-inspected, we identify fewer slaughterhouses. This may be because Vale et al. have access to a more complete set of GTAs for Mato Grosso, and so they pick up some slaughterhouses which we miss. Future versions of this product will seek to clarify these differences.
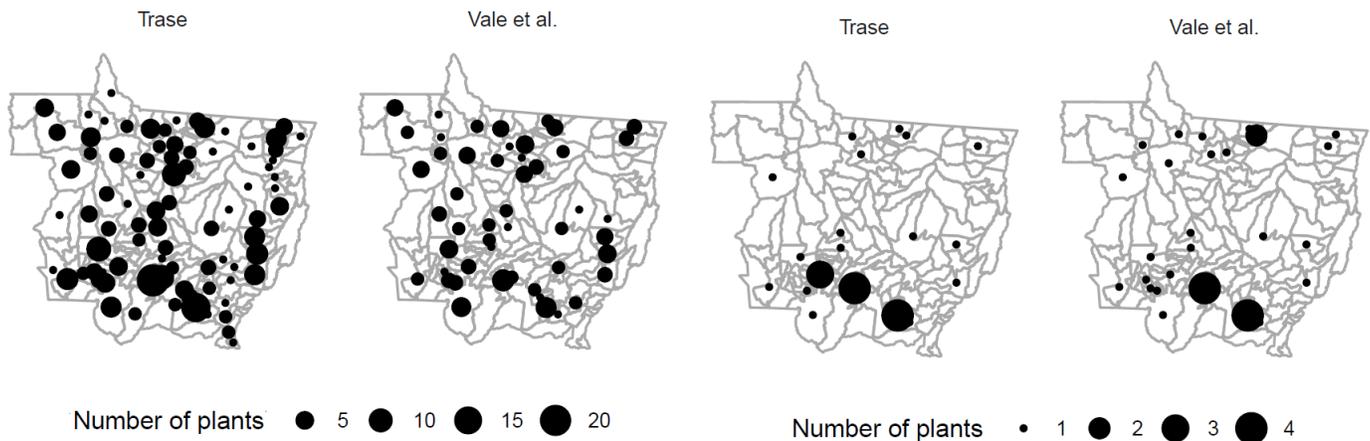

Figure 2 – Comparison of the number of slaughter plants identified in Mato Grosso in this product ("Trase") and Vale et al. The left two plots include all slaughterhouse facilities, and the right two plots include only non-inactive state- and federally-inspected facilities.

Columns:

ID – A unique identifier for each slaughterhouse.

COMPANY – Name of the company listed in the business registry ("Nome Empresarial" in Portuguese). In some cases, the entity listed is the municipality government – these cases refer to slaughterhouse facilities that are publicly owned and operated by the municipality.

STATE – the state in which the slaughterhouse is located.

MUNICIPALITY - the municipality in which the slaughterhouse is located.

GEOCODE – The municipal code, a unique identifier used by the Instituto Brasileiro de Geografia e Estatística (IBGE), as recorded in the government registry of businesses. Businesses can relocate, however, and where the location of the facility changes over time (according to the GTAs), the most recent location is reported.

LAT – latitude. The map is projected in WGS84 ("+proj=longlat +datum=WGS84 +no_defs +ellps=WGS84 +towgs84=0,0,0").

LONG – longitude. The map is projected in WGS84 ("+proj=longlat +datum=WGS84 +no_defs +ellps=WGS84 +towgs84=0,0,0").

RESOLUTION – the spatial location of the slaughterhouse is listed as: LAPIG, ABIEC, IMAZON, CEP, or MUNICIPAL CAPITAL, depending on the dataset used to determine the location.

SUBCLASS – Facilities are classified as one of three tiers of slaughterhouse, depending on the evidence available that they are indeed active slaughterhouses (Figure 1). The appearance of a facility in the GTAs is a key piece of information in classifying slaughterhouses as "Probable" or "Confirmed". Users should bear in mind that the GTA data used for this classification are variably complete – in some states we have access to a larger proportion of GTAs than in others (see Table 4); in states where GTA data are more complete, users can expect that a greater proportion of active slaughterhouses will have been identified as "Probable" or "Confirmed", rather than "Unconfirmed". There is, however, no available assessment of the completeness or accuracy of the other key datasets (notably the business registry, which may include closed facilities). These datasets also have an influence on the percentage of unconfirmed facilities.

INSPECTION_LEVEL – Slaughterhouses are inspected at one of three levels in Brazil: at the national level (Servico de Inspecao Federal, "SIF"), the state level ("SIE"), or the municipal level ("SIM"). In practice, inspection is incomplete, particularly at the municipal level. The level of inspection for slaughterhouses was identified from published lists of SIF- and SIE-inspected slaughterhouses, and information contained in the datasets from the Sistema Brasileiro de Inspeção de Produtos de Origem Animal (SISBI-POA) and Sistema Brasileiro de Identificação e Certificação de Origem Bovina e. Bubalina (SISBOV) and GTAs. Where slaughterhouses were classified as being inspected by multiple systems (e.g. they appear in SIF and SIE lists, their higher inspection level is recorded (i.e. SIF, in this case). Where slaughterhouses did not appear in any list, the INSPECTION_LEVEL is recorded as "UNKNOWN". The data for SIE-inspections and SIM-inspections are incomplete (because SIE data was available for only 20 states, and there is no comprehensive published list of SIM-inspected slaughterhouses), and so are an underestimate of the number of inspected facilities.

OTHER_NAMES – Other names associated with the business listed in each dataset. These names include the "Título do Estabelecimento", "Razão Social", and "Nome Fantasia" where available.

INSPECTION_NUMBER – The identification number assigned to SIF- and SIE-inspected slaughterhouses. These ID numbers are recorded in the sources described above.

TAC – "SIM" means that the slaughterhouse has signed a Termos de Ajustamento de Conduta (TAC) with the Ministerio Publico Federal (MPF) – a commitment to avoid purchasing cattle from properties with ongoing illegal deforestation. These data come from the 2017 Imazon report.

STATUS – This is recorded as "INATIVO" or NA. Where the slaughterhouse is recorded as being inactive (i.e. no longer operating, "INATIVO") in the SIF database or Imazon's slaughterhouse map, this is recorded here. All other facilities are listed as NA.

ADDRESS – The address listed in the government registry, or other datasets if not available.

DATE_SIF_REGISTERED – For SIF-inspected slaughterhouses, the date that they were registered in the database is recorded.

SIF_CATEGORY – SIF-inspected facilities are classified by their capacity (see Table 1).

Table 1 – SIF size categories listed in column SIF_CATEGORY.

SIF category	Description
MB1	Matadouro de bovinos com velocidade de abate superior a 80 cabeças/hora com industrialização ou estocagem superior a 20 t/dia
MB2	Matadouro de bovinos com velocidade de abate superior a 80 cabeças/hora
MB3	Matadouro de bovinos com velocidade de abate de 40 a 80 cabeças/hora
MB4	Matadouro de bovinos com velocidade de abate de 20 a 40 cabeças/hora
MB5	Matadouro de bovinos com velocidade de abate de até 20 cabeças/hora

MULTIFUNCTIONS – Where slaughterhouses are "Unconfirmed", if they have multiple associated activities (multiple CNAEs), then these activities are listed in this column as a guide to users about the likelihood that the facility engages in other activities, rather than/as well as slaughter. CNAEs are coded to follow the United Nation's International Standard Industrial Classification of All Economic Activities (ISIC).

Data sources:

Table 2 – list of data sources used to identify slaughterhouses.

Name	Notes	Source
Business registry	These data include the name and location of each business, along with its unique identifier the Cadastro Nacional da Pessoa Jurídica (acronym: CNPJ, National Registry of Legal Entities in English), the date the business was opened, and the Classificação Nacional de Atividades Econômicas (National classification of Economic Acitivity), a self-declared activity associated with each facility. When identifying slaughterhouses, we searched for businesses with primary or secondary business activities of "1011201 (Frigorífico - abate de bovinos) and "1011205" (Matadouro - abate de reses sob contrato, exceto abate de suínos).	Commercial vendor.
GTAs	Guia de transito animal – records of the movement of batches of cattle between farms, and between farms and slaughterhouses. These freely-available data were downloaded from state and federal websites, to build a dataset of 25 million GTAs from 23 states. The completeness of the GTA data vary by state (Table 4).	State and federal websites.
SIFs	Government database of food businesses (including slaughterhouses) inspected at the federal level and permitted to export.	http://www.agricultura.gov.br/assuntos/inspecao/produtos-animal/sif
SIEs	Lists of state-inspected slaughterhouses were downloaded from state government websites for AL, AM, AP, BA, CE, ES, MA, MG, MS, MT, PA, PB, PE, PR, RJ, RN, RO, SC, SP, and TO.	State government websites.
SISBI-POA	Lists of SISBI-registered food businesses (including slaughterhouses) were downloaded from the SISBI website.	http://www.agricultura.gov.br/assuntos/inspecao/produtos-animal/sisbi-1
SISBOV	A list of SISBOV-compliant slaughterhouses was downloaded.	http://bi.agricultura.gov.br/reports/rwservlet?sisbov_cons&frigorificos_web.rdf

Table 3 – list of data sources used to map slaughterhouses in space.

Name	Notes	Source
Imazon slaughterhouse map	Map of slaughterhouses that accompanied the report: Os Frigoríficos vão ajudar a zerar o desmatamento na Amazônia? Paulo Barreto et al; Belém, PA: Imazon; Cuiabá: Instituto Centro da Vida, 2017	http://imazon.org.br/publicacoes/os-frigorificos-vao-ajudar-o-desmatamento-da-amazonia/
Lapig slaughterhouse map	Map of SIF-inspected slaughterhouses.	http://maps.lapig.iesa.ufg.br/
ABIEC slaughterhouse map	Map of slaughterhouses provided by the Associação Brasileira das Indústrias Exportadoras de Carnes (ABIEC)	Shared with authors.
Postal codes	Slaughterhouses not linked to the datasets above were mapped based on their postal code (CEP), using the cepR [R] package.	https://github.com/RobertMyles/cepR

Table 4 – Estimates of the maximum percentage of slaughter in each state that is captured in the GTAs used to identify slaughterhouses for this map. GTA data are from 2012–2017, and the maximum percentage is the highest percentage in any one year of the state's slaughter that is reported in the GTAs (rounded to the nearest 5). This percentage was calculated by comparing slaughter figures (number of head per year) in the GTAs against the Ibge trimestral survey figures for animal slaughter (https://sidra.ibge.gov.br/tabela/1092). In states where GTA data are more complete, users can have greater confidence that active slaughterhouses will have been identified as "confirmed" or "probable", rather than "unconfirmed".

State	Percentage of state slaughter captured in GTAs (max)
Acre	0
Alagoas	>90
Amapá	0
Amazonas	25
Bahia	55
Ceará	20
Distrito Federal	UNKNOWN
Espírito Santo	50
Goiás	0
Maranhão	40
Mato Grosso	40
Mato Grosso do Sul	10
Minas Gerais	85
Pará	80
Paraíba	80
Paraná	10
Pernambuco	>90
Piauí	60
Rio de Janeiro	>90
Rio Grande do Norte	>90
Rio Grande do Sul	>90
Rondônia	5
Roraima	0

Santa Catarina	20
São Paulo	35
Sergipe	75
Tocantins	45